REMARKS

This application has been carefully reviewed in light of the Office Action of November 23, 2004, wherein:

A.   The disclosure was objected to because of informalities;

B.   Claims 35, 37, 39, 41, 43, and 45 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention;

C.   Claims 1-3, 12-15, and 23-25 were rejected under 35 U.S.C. §102(e) as being anticipated by Bofill et al. (Blind Separation of More Sources than Mixtures Using Sparsity of their Short-Time Fourier Transform), herein referred to as the "Bofill reference;"

D.   Claims 5, 16, and 27 are rejected under 35 U.S.C. §103(a) as being unpatentable over the Bofill reference;

E.   Claims 4, 6, 15, 17, 26 and 28 are rejected under 35 U.S.C. §103(a) as being unpatentable over the Bofill reference in view of U.S. Patent No. 6,182,018 to Tran et al., herein referred to as the "Tran reference;"

F.   Claims 34, 36, 38, 40, 42 and 44 are rejected under 35 U.S.C. §103(a) as being unpatentable over the Bofill reference in view of Sahlin et al. (The Asymptotic Cramer-Rao Lower Bound for Blind Signal Separation), herein referred to as the "Sahlin reference;"

G.   Claims 7-11, 18-22, and 29-33 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all the limitations of the base claim and any intervening claims; and

H. Claims 35, 37, 39, 41, 43, and 45 are rejected under 35 USC 112, 2nd paragraph, and objected to as being dependent upon a rejected base claim.

Specification

A. Turning now to the Office Action, the Examiner objected to the specification because of informalities.

The Examiner stated that "on page 5, line 14, one instance of the phrase 'a data processing' should be deleted.

The Applicants thank the Examiner for pointing out this typographical error, and have amended the specification to remove one instance of the phrase "a data processing." The Applicants respectfully request that the Examiner accept the proposed amendments and withdraw this objection.

Claim Amendments

The Applicants have cancelled Claims 4, 6, 15, 17, 26, and 28. The cancellation of these claims is not related to the prior art. Instead, the Applicants have decided not to pursue these claims at this time. These claims are cancelled without prejudice.

Claim Rejections – 35 U.S.C. §112

B. The Examiner rejected Claims 35, 37, 39, 41, 43, and 45 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 35, 37, 39, 41, 43, and 45 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner stated that "[d]ependent claims 35, 37, 39, 41, 43, and 45 refer to an apparatus, method, and computer program product for the determination of a CR bound for both an estimated mixing matrix A and an estimated signal matrix S. The claims cite a parameter λ^2_k that is developed from a parameter W(S) that is described at one point in the specification as being in either the Fourier domain or the wavelet domain (page 26, lines 18-19). However, the parameter W(S) is also described as being solely in the wavelet domain (page 25, lines 19-21). Thus, it is not clear whether the parameter W(S) is intended to limit the scope of the claims to a transform of S to the wavelet domain, or to indicate both the transform of S to the wavelet domain and the Fourier domain."

The Applicants respectfully disagree with the Examiner that it is not clear from the specification whether the parameter W(S) is intended to limit the scope of the claims to a transform of S to the wavelet domain, or to indicate both transform of S to the wavelet domain and the Fourier domain. The Applicants submit that the specification is clear in that the transform of S can be in either the wavelet domain or the Fourier domain.

In the specification on page 24, starting at line 7, it states "[a] more specific flow diagram depicting the operation of a preferred embodiment for jointly and iteratively optimizing the estimated mixing matrix ... ." Thus, this paragraph is introducing the fact that the following description is one embodiment. The next paragraphs describe this particular embodiment, and in this embodiment, the parameter W(S) is in the wavelet domain. After describing one specific embodiment, the specification continues in describing more generally joint optimization, as is indicated by lines 2-3 on page 26, stating "[g]reater detail with regard to the joint optimization is provided below." It is now, in the more general discussion of joint optimization, that W(S) can be in either the Fourier domain or the wavelet domain as stated on page 26, lines 18-19. Therefore, the Applicants submit that it is clear from the specification that the parameter W(S) can be in either the Fourier domain or the wavelet domain. Thus, the parameter W(S) is not intended to limit the scope of the claims to the wavelet domain.

The Applicant believes that with the aforementioned remarks, the claims are not indefinite and satisfy the requirements of 35 U.S.C. §112. Thus, the Applicant respectfully requests that the Examiner withdraw this rejection.

Claim Rejections – 35 U.S.C. §102

C. Claims 1-3, 12-15, and 23-25 under 35 USC §102(e) as being anticipated by *Blind Separation of More Sources Than Mixtures Using Sparsity of Their Short-time Fourier Transform* by Bofill et al., herein referred to as the "Bofill reference."

Regarding Claims 1, 12 and 23

In the Office Action, the Examiner rejected Claim 1 (and likewise Claims 12 and 23). The Examiner stated that the Bofill reference (on page 88, 1st col., equation 7, and lines 1-2 after equation 7) discloses "viii. means for jointly optimizing the source signal estimate matrix and the estimated mixing matrix in an iterative manner, to generate an optimized source signal estimate matrix and a final estimated mixing matrix." The Examiner stated that the Bofill reference teaches at each iteration, S is solved for the current estimate of A. The Applicants respectfully disagree with the conclusion drawn by the Examiner.

Claim 1 claims, in part "means for jointly optimizing." Section 2, page 88 of the Bofill reference is entitled "Estimating the Mixing Matrix and the Sources Separately." Further, while the Bofill reference does teach that S is solved for the current estimate of A,

there is no hint as to generating "an optimized source signal estimate matrix" and "a final estimated mixing matrix" as is claimed in Claim 1.

In addition, Claim 1 claims "ix. means for restoring the separated source signals from the optimized source signal estimate matrix, whereby a plurality of mixed signals from unknown sources traveling through an environment with added noise may be separated so that the original, separate signals may be reconstructed." The Examiner rejected this element by stating that the Bofill reference teaches that a matrix S is found, representing the underlying source signals (page 87, 1st col., section 1, line 6), and is transformed to the original domain after separation in the sparse domain (page 88, 2nd col.. section 3, lines 6-11). The Applicants respectfully disagree with the conclusion drawn by the Examiner.

First, the Applicants point out that page 87, 1st col., section 1, line 6 simply defines that S is the NxT matrix of underlying source signals, to explain what S is in equation (1). The Applicants are unclear how the Examiner is interpreting this definition to be "the optimized source signal estimate matrix" as is claimed in Claim 1.

In addition, page 88, 2nd col., section 3, discusses the transform of the mixing matrix, stating "Then each mixture was FFT-transformed ... . Now almost all the data points are neatly clustered along the six directions of the columns of the mixing matrix, thus providing good separability." The Applicants do not understand how the Examiner is interpreting this discussion of transforming the mixing matrix as a "means for restoring the separated source signals from the optimized source signal estimate matrix" as is claimed in Claim 1.

For the forgoing reasons, the Applicants submit that Claim 1 is patentable over the cited prior art. In addition, the Applicants submit that Claims 12 and 23 are also patentable over the cited prior art. Further, the Applicants submit that Claims 2-3, 5, 7-11, 13-14, 16, 18-22, 24-25, 27, and 29-33 are patentable either on Claim 1, 12 or 23 and, as such, are patentable over the prior art at least through their dependence upon an allowable base claim.

Regarding Claims 3, 14 and 25

In the Office Action, the Examiner rejected Claim 3 (and likewise Claims 14 and 25). The Examiner stated the Bofill reference discloses "ii. means for evaluating a convergence criteria based on the clustered mixed signal samples to determine whether the convergence criteria are met, and if the convergence criteria are not met, iteratively adjusting the clustering of the mixed signal samples and parameters of the geometric constraint to create a new set of clusters until the convergence criteria are met, to provide a final estimated mixing matrix," by

citing to page 89, 1st col., lines 4-11 of the Bofill reference, where the Examiner stated "computations for the mixing matrix A are started with a courser grid, corresponding to less convergence, then refined with a thinner grid, corresponding to more convergence." The Applicants disagree with the Examiner's characterization of the Bofill reference.

In order to establish a *prima facie* case of anticipation , the Examiner must set forth an argument that provides (1) a single reference (2) that teaches or enables (3) each of the claimed elements (as arranged in the claim) (4) either expressly or inherently and (5) as interpreted by one of ordinary skill in the art. All of these factors must be present, or a case of anticipation is not met. Thus, "[a]nticipation requires that every element of the claims appear in a single reference ..." Continental can Co. USA v. Monsanto Co. 948 F.2d 1264. The Applicants do not understand how the Examiner is interpreting the Bofill reference to teach all of the elements of Claim 3.

Specifically, the Examiner stated that he was interpreting the element i. "means for clustering the mixed signal samples using a geometric constraint" of Claim 3 by the directions on page 88, 2nd col., section 4, lines 1-4 of the Bofill reference. The directions listed in this section are the "directions of the columns of the mixing matrix." The next element states that "if the convergence criteria are not met, iteratively adjusting the clustering of the mixed signal samples and parameters of the geometric constraint." The Applicants are unaware where in the Bofill reference, the Examiner believes that this limitation is taught, disclosed or suggested. The Examiner refers to page 89, 1st col., lines 4-11. The Applicants are unaware where the Bofill reference teaches "iteratively adjusting the ... parameters of the geometric constraint," as claimed by Claim 3, in light of the Examiner's assertion that the directions of the columns of the mixing matrix are the means for clustering the mixed signal samples using a geometric constraint. Therefore, the Applicants respectfully request that if the Examiner continues to maintain his rejection of Claim 3, that the Examiner specifically point out to the Applicants how he is interpreting the Bofill reference to teach, disclose or suggest each and every element as set forth in Claim 3.

The same arguments presented regarding Claim 3 can also be applied to Claims 14 and 25. Therefore, in light of the foregoing, the Applicants submit that Claims 3, 14 and 25 are patentable over the prior art cited.

Claim Rejections under 35 U.S.C. §103

D.   Claims 5, 16, and 27 are rejected under 35 U.S.C. §103(a) as being unpatentable over the Bofill reference.

In regards to Claims 5 (and also 16 and 27) the Examiner rejected Claim 5 as being unpatentable over the Bofill reference because it would have been obvious to one of ordinary skill in the art, at the time of invention, to modify the Bofill reference to perform the joint optimization of S and A in the presence of noise, using the relationship X=AS+V, since, as is well-known in the art, any communications channel generally will add noise to a signal. Further, the Examiner stated that by performing the optimization disclosed by the Bofill reference for the noise case, the estimates of S and A would be more accurate and would reduce unwanted noise in the reconstructed signal matrix S.   The Applicants respectfully disagree with the conclusions drawn by the Examiner.

The Applicants agree with the Examiner that it is well known in the art that any communications channel generally adds noise to a signal. However, the Applicants disagree with the Examiner that it would be obvious of one of ordinary skill in the art, at the time of invention, to modify the Bofill reference to perform the joint optimization of S and A in the presence of noise.

The Applicants submit that noise adds complexity to systems. For example, equation (5) of the Bofill reference is an equation for estimating the mixing matrix in the presence of noise, while equation (6) is for estimating the mixing matrix in the absence of noise. The Bofill reference then teaches that equation (6) can be formulated as a linear programming problem, but does not indicate how equation (5) may be solved. Further, the lines under equation (7) of the Bofill reference teach that the solution to equation (6) [the equation without noise] should be used in solving the problem. The Applicants submit that one skilled in the art could not modify the Bofill reference to perform the joint optimization of S and A in the presence of noise, because the solution of equation (5) is difficult if not impossible to find. Or in any event, no insight as to how to find the solution is given in the Bofill reference.

If the Examiner continues to maintain his rejection of Claim 5 as being obvious over the Bofill reference, the Applicants respectfully request that the Examiner submit an affidavit as required under 37 CFR 1.104(d)(2), see MPEP section 2144.04(C).

In the absence of an affidavit from the Examiner, the Applicants submit that Claim 5 is patentable over the cited prior art.

The same arguments presented above regarding Claim 5 can also be applied to Claims 16 and 27. Therefore, the Applicants submit that Claims 5, 16 and 27 are patentable over the cited prior art.

E.   Claims 4, 6, 15, 17, 26 and 28 are rejected under 35 U.S.C. §103(a) as being unpatentable over the Bofill reference in view of U.S. Patent No. 6,182,018 to Tran et al., herein referred to as the "Tran reference."

The Applicants have elected to cancel Claims 4, 6, 15, 17, 26 and 28. The cancellation of these claims is not related to the references cited by the Examiner, but instead due to reconsideration on behalf of the Applicants.   The claims are cancelled without prejudice.

F.   Claims 34, 36, 38, 40, 42, and 44 are rejected under 35 U.S.C. §103(a) as being unpatentable over the Bofill reference in view of Sahlin et al. (The Asymptotic Cramer-Rao Lower Bound for Blind Signal Separation), herein referred to as the "Sahlin reference."

Regarding Claims 34, 36, 38, 40, 42 and 44, the Examiner stated that the Bofill reference does not disclose determining a CR bound for an estimated mixing matrix A, or for an estimated mixing matrix S. The Examiner further stated that the Sahlin reference discloses that a lower bound for a matrix of parameter estimates is given by the Cramer-Rao Lower Bound (page 1, 1st col., section 1, line 9 through 2nd col., line 1. The Examiner asserted that it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the Bofill reference to determine a CR bound for an estimated mixing matrix A and an estimated source matrix S, in order to provide a benchmark to compare other algorithms, as taught by the Sahlin reference (page 1, 2nd col., lines 8-10. The Applicants respectfully disagree with the conclusion drawn by the Examiner.

As stated in MPEP 706.02(j), to establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)

The Applicants submit that there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the references or to combine the reference teachings. The Sahlin reference deals source separation when the number of sources is known. The Sahlin reference teaches the use of CRLB for the source separation problem when the number of sources is known. The Applicants are unaware where in the Sahlin reference it is taught, disclosed or suggested to use the CRLB method when the number of sources is unknown, as is the case in the present application. Further, the Bofill reference teaches other methods for estimating the variance. Thus, there is no suggestion or motivation in the Bofill reference that another estimation technique is needed. Thus, the Applicants submit that there is no motivation or suggestion found in either reference to combine the reference teachings.

In light of the foregoing, the Applicants submit that Claims 34, 36, 38, 40, 42, and 44 are patentable over the cited prior art. In addition, the Applicants submit that Claims 35, 37, 39, 41, 43, and 45 are dependent upon one of Claims 34, 36, 38, 40, 42, and 44. Therefore, the Applicants submit that Claims 35, 37, 39, 41, 43, and 45 are patentable over the cited prior art at least through their dependence upon an allowable base claim.

Allowable Subject Matter

G. Claims 7-11, 18-22, and 29-33 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all the limitations of the base claim and any intervening claims.

The Applicants thank the Examiner for his acknowledgement that Claims 7-11, 18-22 and 29-33 contain patentable subject matter.

H. Claims 35, 37, 39, 41, 43, and 45 are rejected under 35 USC 112, 2nd paragraph, and objected to as being dependent upon a rejected base claim.

The Applicants thank the Examiner for his acknowledgement that Claims 35, 37, 39, 41, 43, and 45 contain patentable subject matter.

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Concluding Remarks:

The Applicant respectfully submits that in light of the above comments and remarks, pending Claims 1-3, 5, 7-14, 16, 18-25, 27, and 29-45 are now in allowable condition.

10 The Applicant thus respectfully requests timely allowance of all of the pending claims.

In the event the Examiner wishes to discuss any aspect of this response, or believes that a conversation with either Applicant or Applicant's representative would be beneficial the Examiner is encouraged to contact the undersigned at the telephone number indicated

15 below.

The Commissioner is authorized to charge any additional fees which may be required or credit overpayment to deposit account no. 50-2691. In particular, if this response is not timely filed, the Commissioner is authorized to treat this response as including a petition

20 to extend the time period pursuant to 37 CFR 1.136(a) requesting an extension of time of the number of months necessary to make this response timely filed. The petition fee due in connection therewith may be charged to deposit account no. 50-2691.

Respectfully submitted,

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